



16 September 1996

William F. Caton, Secretary
Federal Communications Commission
Room 222
1919 M Street N.W.
Washington, D.C. 20554

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Dear Mr. Secretary,

Enclosed are Transcript International Inc's. comments on the Notice of Proposed Rule Making (NPRM) 96-86

Sincerely,
TRANSCRIPT INTERNATIONAL

A handwritten signature in black ink, appearing to read "Jeff Fuller", is written over the company name.

Jeff Fuller
President and COO

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WT Docket No. 96-86

I. INTRODUCTION

During the past several years, Transcript has developed advanced digital technologies and has been an early leader in the development of digital radio in the US. The development of an APCO Project 25 digital radio will allow Transcript to be an early provider of leading edge digital equipment, beginning with shipments of digital APCO 25 portables in September of 1996. APCO 25 digital mobiles and base stations will be available by early 1997. Transcript is committed to becoming a leader in the development and distribution of Digital radio to public safety and government in the US and worldwide.

Transcript International strongly supports the process that the FCC is using via PSWAC and this NPRM to help identify and provide recommendations and regulatory

approach's to solve the very serious issues that face the public safety users wireless communication needs. There are many deficiencies in the public safety wireless communications systems currently in use nation-wide. The most serious of these deficiencies is the lack of interoperability, poor levels of efficiency and effectiveness, lack of advanced communication facilities, such as mobile data, video, fax, and the continuing lack of frequency spectrum. Transcript's agrees that no one individual approach will satisfy the needs of all public safety users, but a combination of approaches will be necessary.

PSWAC tentative definitions of 'public safety' are sufficiently broad and fairly describe and encompass the function and responsibilities of the various public safety agencies. These definitions will allow for much better continuity between public safety agencies and will make licensing and system design criteria much more manageable. Interoperability will be greatly enhanced as current public safety services are divided into several 'radio services' with assigned frequencies spread all over the spectrum, making interoperability difficult at best. Transcript concurs with PSWAC and agrees that the definitions of interoperability will facilitate the expeditious development of interoperability for public safety agencies. We further agree that the conclusions drawn concerning the need for interoperability are valid.

Initial interoperability efforts designed to address multi-jurisdictional and multi-discipline problems being implemented by agencies in California, Colorado, Nevada, and South Carolina are a good initial step; especially if they conform to a standard such as APCO Project 25. We agree with PSWAC in their assessment of the various solutions that are available to provide interoperability. We further agree that establishment of new universal mutual aid channels is a very positive initial first step.

Transcript strongly disagrees with the multi-band radio approach to interoperability. Amateur radio equipment is not designed for the stringent requirements that public safety equipment must meet. The cost to design a public safety radio with the high level of performance that is required for operation in that environment would be cost prohibitive for many smaller agencies. A single purpose radio is the only viable approach, but brings with it the burden, in many cases, of carrying multiple radios. Currently many agencies use multiple radios to accomplish some forms of multi-jurisdictional and multi-discipline interoperability, but only within a localized area. Universal mutual aid channels will provide the facilities to allow true multi-jurisdictional and multi-discipline interoperability on a nation-wide basis, using only one additional purpose built radio. This will provide a significant improvement over the current limited method being used today.

Transcript recognizes the serious problem with lack of frequency spectrum and the need for spectrally-efficient solutions. Transcript very firmly holds that FDMA is currently the technology of choice for public safety communications.

In August 1990, the APCO Project 25 Steering Committee and participating manufacturers began detailed assessment of the access methods available for this project. There were three contenders: CDMA (Code Division Multiple Access), FDMA

(Frequency Division Multiple Access) and TDMA (Time Division Multiple Access). CDMA was quickly rejected as inappropriate for the public safety environment for many reasons.

In the case of FDMA, the channel is split in half (as proposed for the FCC Docket 92-232 and already adopted by the federal government for all federal channels), giving each user 50 percent of the channel 100 percent of the time. With TDMA, the full channel is split into time slots — rotating hundreds of times a second — that are assigned to each user. The TDMA system proposed to APCO Project 25 has two time slots such that each user occupies 100 percent of the channel 50 percent of the time.

Equipment technical standards proposed for APCO Project 25 have been carefully evaluated and — usually — field tested. Each has been subjected to review and comment by the entire TIA-25 committee in open meetings.

A summary of the reasons for the selection of FDMA by APCO Project 25's New Technology Subcommittee follows:

FDMA provides an immediate migration to 12.5 kHz channels, resulting in a doubling of available channels to state/local users in bands above 450 MHz [except for 800 MHz in the US called the National Public Safety Plan or NPSPAC channels (821-824/866-869 MHz) that are already at 12.5 kHz spacing with geographical limitations], and in all federal bands as equipment is changed. The 12.5 kHz channel plan is now a federal government standard and appears to be the maximum single channel width that will be authorized by the FCC as a result of its Docket 92-235 for all bands below 800 MHz. 12.5 kHz FDMA equipment uses off-the-shelf components designed specifically for the land mobile radio services. It does not use modified cellular telephone equipment generally designed for low-power systems with a very large support infrastructure.

Public safety relies heavily on portable-to-portable and/or mobile-to-mobile intercommunications without the use of a repeater, particularly for tactical operations such as mutual aid. TDMA does not easily support a 'talk-around' mode due to the requirement for a common controller to synchronize time slots. This is a critical issue. In fact, it is so critical for mutual aid interoperability that, once an interim standard is adopted, APCO will probably petition the FCC to require that the APCO Project 25 standard mode of operation be required to be supported, in addition to any other modes, in all digital radios certified by the FCC for the Public Safety Radio Services. This is APCO Project 25's baseline standard and 'lowest common denominator'; without it, there is no interoperability. APCO Project 25 has been recommended to be the US Government standards already. APCO Project 25 standards will directly effect US Government agencies such as; FBI, Drug Enforcement Agency (DEA), Department of Defense (DOD), Immigration and Naturalization Services (INS), Army, Navy, etc.

Another major drawback to TDMA is spectrum inefficiency. Unless an agency can justify and make use of all time slots within a single channel or allow another jurisdiction

needing virtually identical geographic coverage to share its system, spectrum is wasted. With FDMA, the agency uses only the justified portion of the spectrum.

If small agencies are to make use of TDMA and meet channel loading requirements, consolidation within common geographical radio coverage areas is essential. That could mean consolidating law enforcement with fire and/or medical services, or consolidating a number of smaller law enforcement agencies within a larger agency. All have real and significant operational and political considerations. To implement any new technology, an agency will have to change out all equipment unless that new technology also supports a backward compatibility to today's FM systems. This is a key requirement of Project 25's proposed multi-mode standard. With no migration path, a complete system change out is required with each new generation of equipment.

Within Europe, manufacturers representing the entire mobile radio community have been meeting for several years to develop standards for the Trans-European Trunked Radio system (TETRA). This standard employs four-slot TDMA in a 25 kHz channel. While APCO Project 25 has followed TETRA with interest, differences in population, geography and the fact that many public safety organizations operate (or receive the majority of funding) at the national level have indicated TDMA may be an appropriate choice.

Authorities and organizations in several countries, together with manufacturers, have carried out investigations with the result that for users with security tasks the channel access method of FDMA is optimum. The main benefits listed include smaller infrastructure costs for the coverage of the service, good frequency economy, fixed allocation of channels for closed groups, usage of existing network infrastructure, more economical use of available frequency ranges and much-improved operation and stand-by of mobile terminals. These countries represent an equipment base of over 760,000 mobile units.

APCO Project 25 has selected a data rate of 9,600 bits per second (bps), a standard computer data rate, as part of the CAI (common air interface). This data rate can be easily handled within a 12.5 kHz channel. As mentioned earlier, APCO Project 25 has a future target of a 6.25 kHz channel for its second generation of recommended standards. The Department of Defense, a potential major user of APCO Project 25 equipment, funded an independent study verifying the fact that 9.6 kbps can be carried in a 6.25 kHz channel using the projected modulation system, which encodes the digital signal onto the airwaves and is backwards compatible to APCO Project 25's first generation receivers. Interestingly, the TDMA proposal provides two 8.0 kbps slots in a 12.5 kHz channel at a total data rate of 16 kbps per 12.5 kHz. APCO Project 25's target of 9.6 kbps over a 6.25 kHz channel equals 19.2 kbps per 12.5 kHz, a 20 percent increase in data rate over the TDMA proposal.

Most spectrum efficiency arguments relate to channel access method and data rate. In fact, efficiency can be defined as how many communications links, or 'talk-paths', can be operated simultaneously in a given amount of spectrum by the same or different agen-

cies, and how much information can be passed along the talk paths in a given time (data rate).

For 450-821 MHz bands and in all the U.S. federal bands, current channels are 25 kHz wide. Theoretical spectrum efficiency will be no different between TDMA and FDMA when 6.25 kHz APCO Project 25 systems are in place, except for the 20 percent reduction in the TDMA effective data rate mentioned previously. The 800 MHz NPSPAC band is already channeled at 12.5 kHz. However, since analog equipment requires more than a 12.5 MHz bandwidth, users are separated by a number of miles to prevent interference. APCO Project 25 will provide equipment that eliminates this mileage separation and, once at 6.25 kHz, will again be identical in efficiency between FDMA and TDMA, except for TDMA's reduced data rate.

In reality, spectrum relief will come from FDMA in the same manner as it has in the past when channel widths were split. It will be on a phased basis and will come as the result of many (eventually all) users moving to 12.5 kHz (and finally to 6.25 kHz) equipment, allowing all licensees to benefit from the re-channeling of an entire band, without regard to their actual operating frequency or where they are geographically with respect to users of their adjacent channels.

Transcript does not support an FCC mandated 'standard' we believe however, in a 'market driven' standard such as APCO Project 25. Once digital equipment is selected by agency choice, or as mandated by the FCC due to its ruling (per Docket 92-235) in a few years there must again be a 'lowest common denominator' for interoperability, just as we have with today's simplex analog mutual aid channels.

Digital systems are very complex and require more documentation than their analog counterparts; each piece of the system, the value and place of each bit of data, must be defined. As each neighboring agency replaces their system with a new digital system, unless there is a 'lowest common denominator' there will be no interoperability — ever. With cost and officer safety issues surrounding today's communications systems, is it just not possible for an agency to justify the purchase of incompatible emergency communications equipment to their administrators and elected officials. Without regard to other issues, such as competitive procurement, there must be a 'lowest common denominator' of operation for mutual aid between systems. For anyone who has ever been involved in an earthquake, flood, hurricane, tornado or wildfire, this issue requires no further explanation. Transcript strongly believes that APCO project 25 is that 'lowest common denominator'.

III. APCO PROJECT 25 WILL PROMOTE COMPETITION IN THE SUPPLY OF GOODS AND SERVICES AS WELL AS PROVIDE THE ESSENTIAL ELEMENTS OF INTEROPERABILITY, SPECTRUM EFFICIENCY, AND BACKWARDS COMPATIBILITY REQUIRED BY PUBLIC SAFETY AGENCIES THROUGH THE YEAR 2010.

In August 1995 at the APCO International Conference and Exposition the final documents establishing the APCO 25 Standards were approved and signed. At this conference a history making demonstration of interoperability was made utilizing equipment from various radio manufacturers, including Transcrypt International. The demonstration was an overwhelming success. Even doubters were impressed and convinced that multi-vendor interoperability was not only possible but truly a reality made possible by the APCO 25 voluntary standard.

APCO 25 brought representatives from many state, local, and federal government agencies, as well as private industry, together with the common goal of finding real solutions to their growing need for spectral efficient, digital, secure, interoperable, and backward compatible radio systems. In addition, international, private and governmental participation has made APCO 25 a worldwide standard-setting initiative. APCO 25 is moving technology along a common path that benefits a great number of users worldwide.

Transcrypt International has always been and is currently an active participant in the APCO 25 project team. The team's objective has been to provide a fully open process to seek out new two-way digital radio technologies from a large base of industry leading private sector developers. The open standards established today by APCO 25 meet those objectives and allow multiple vendors to make competing products that are fully interoperable. Had it not been for APCO Project 25 standards, Transcrypt would not and could not have participated in the manufacture and sale of digital communications systems for public safety use. As a small company we would not have been able to promulgate a new digital standard to the wireless community. APCO Project 25 has finally opened the previously closed public safety market to all that want to participate.

Every aspect of APCO 25 is designed to benefit the federal and state professionals who seek and require a new level of performance, efficiency, capabilities, and quality in two-way radio communications. The following are four key areas that provided the impetus behind this open process.

- Provide enhanced functionality with equipment and capabilities focused on federal and state needs.
- Improve spectrum efficiency.
- Ensure competition among multiple vendors through Open Systems Architecture.
- Allow effective, efficient, and reliable intra-agency and inter-agency communications between old equipment and new.

APCO Project 25 is committed to maintaining backward compatibility with the enormous installed base of conventional equipment, while providing a technologically secure upgrade path to the new spectral efficient digital radio technology. This approach allows mixed system operation on a channel by channel basis making for an orderly migration path.

Public safety agencies specifying and purchasing APCO Project 25 compliant radios and systems are assured of a market driven industry standard migration path that will allow them to meet the FCC's mandated goal of moving from wide band to narrow band technology. It also ensures interoperability between participating agencies nationally and in selected areas worldwide while always offering backwards compatibility with the current standard of 25 kHz FM. Users will be rewarded with a wide range of interoperable radios from a number of manufacturers packed with a wide range of competing features.

IV. CONCLUSION

Transcript supports the key recommendations of the PSWAC Report and strongly urges the FCC to implement these recommendations. The most critical of these recommendations is the need for additional frequency spectrum and greater interoperability.

Transcript supports the APCO Project 25 market driven standard and strongly urges the FCC not to impede its immediate deployment or to regulate it.

APCO Project 25 standard will provide nation wide multi-jurisdictional and multi-discipline interoperability without being infrastructure dependent. Project 25 finally opens up and promotes vendor competition within the public safety market. Project 25 greatly encourages companies to manufacture new digital communications equipment because it will be based on a user driven standard.

APCO Project 25 will immediately double the available spectrum by slicing the current 25kHz channels into two 12.5 kHz channels with a further doubling in phase II of Project 25 when 6.25 kHz channels will become the standard.